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ABSTRACT

The study of verbal behavior has a long history in the Soviet Union, and some of the studies, especially those related to verbal conditioning and learning, have had considerable impact on Western research, particularly in the United States. The view set forth in this paper is that "voluntary behavior" is only that behavior which is verbally controlled and that such behavior is disturbed when the verbal instructions conflict with the child's own movements (stereotypia), or with his immediate perceptions (echopraxia). While Soviet psychological theory posits that voluntary behavior is typically verbally controlled behavior, it is argued here that voluntary behavior is only that behavior which is verbally controlled. It is precisely this fact which distinguishes the verbal control of behavior (either external or internal) from other forms of control. (RB)

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RECENT DEVELOPMENTS IN SOVIET RESEARCH ON THE VERBAL CONTROL OF VOLUNTARY MOTOR BEHAVIOR

by

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Report from the Project on
Children's Learning and Development

Wisconsin Research and Development
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Statement of Focus

Individually Guided Education (IGE) is a new comprehensive system of elementary education. The following components of the IGE system are in varying stages of development and implementation: a new organization for instruction and related administrative arrangements; a model of instructional programing for the individual student; and curriculum components in prereading, reading, mathematics, motivation, and environmental education. The development of other curriculum components, of a system for managing instruction by computer, and of instructional strategies is needed to complete the system. Continuing programmatic research is required to provide a sound knowledge base for the components under development and for improved second generation components. Finally, systematic implementation is essential so that the products will function properly in the IGE schools.

The Center plans and carries out the research, development, and implementation components of its IGE program in this sequence: (1) identify the needs and delimit the component problem area; (2) assess the possible constraints—financial resources and availability of staff; (3) formulate general plans and specific procedures for solving the problems; (4) secure and allocate human and material resources to carry out the plans; (5) provide for effective communication among personnel and efficient management of activities and resources; and (6) evaluate the effectiveness of each activity and its contribution to the total program and correct any difficulties through feedback mechanisms and appropriate management techniques.

A self-renewing system of elementary education is projected in each participating elementary school, i.e., one which is less dependent on external sources for direction and is more responsive to the needs of the children attending each particular school. In the IGE schools, Center-developed and other curriculum products compatible with the Center's instructional programing model will lead to higher student achievement and self-direction in learning and in conduct and also to higher morale and job satisfaction among educational personnel. Each developmental product makes its unique contribution to IGE as it is implemented in the schools. The various research components add to the knowledge of Center practitioners, developers, and theorists.

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Abstract

This paper, which reports the results of the author's information-gathering trip to Moscow and Kiev, U.S.S.R., in June-July 1972, was presented at the Biennial meetings of the International Society for the Study of Behavioral Development, August, 1973. It is suggested that "voluntary behavior" is only that behavior which is verbally controlled, and that such behavior is disturbed when the verbal instructions conflict with the child's own movements (stereotypia), or with his immediate perceptions (echopraxia).

I
Introduction

The study of verbal behavior has had a long and dignified history in the Soviet Union. Some of the studies, especially those related to verbal conditioning and learning, have had considerable impact on Western research, particularly in the United States. However, as Cole and Maltzman (1969) have pointed out, a comparatively small amount of Soviet psychological research utilizes such paradigms. The influence of Pavlov, on Soviet psychology at least, went far beyond simple conditioning.

Soviet research on the verbal control of behavior, much of which was conducted under the direction of A. R. Luria (1961), is an excellent example of a non-Pavlovian paradigm. Yet, because of current theoretical predispositions in the United States, several attempts have been made to interpret this research within mediational learning theory (e.g., Flavell, Beach, & Chinsky, 1966; Langer, 1969; Miller, Shelton, & Flavell, 1970) or by operant conditioning (Meichenbaum & Goodman, 1969). To date, Wozniak (1972) alone has attempted to discuss this research in terms of Soviet theory.

While this paper parallels Wozniak's in purpose, two major differences in approach should be underscored. First, Wozniak goes to great lengths to explain the Soviet ideology of dialectical materialism. While this subject is interesting in its own right, and while it surely does affect Soviet psychological theory, the present paper emphasizes the psychological theory (primarily that of Pavlov and Vygotsky) as it relates to the verbal control of behavior. Second, a different interpretation of "voluntary behavior" is advanced in this paper. Wozniak states that voluntary behavior is

> . . . behavior which is organized via the imposition of 'artificial' (i.e., psychological) stimuli between physical stimulation in the world and response to that stimulation. Such artificial stimuli are usually, but need not necessarily be, speech signals. Thus voluntary behavior is typically 'verbally-controlled' behavior [1972, p. 15].

It will be argued that voluntary behavior is only that behavior which is verbally controlled. It is precisely this fact which distinguishes the verbal control of behavior (either external or internal) from other forms of control. While these lower forms of control may behave according to the same general laws, they lack the strength, mobility, and generalizability of verbal stimuli.

II
General Theoretical Background

In 1950 the Joint Session of the Soviet Academy of Pedagogical Sciences convened for the explicit purpose of Pavlovianizing psychology (Cole & Maltzman, 1969). While such political pressure had unfortunate consequences for many areas of psychological inquiry (e.g., heredity or mental testing), the study of verbal behavior flourished within a Pavlovian framework.

Pavlov characterized language as a higher order or secondary system of signals:

> This supplement is the speech function, the last new principle in the activity of the cerebral hemispheres. If our sensations and concepts relating to the surrounding world are for us the primary signals of reality, the concrete signals--then the speech, chiefly the kinesthetic stimulations flowing into the cortex from the speech organs, are the secondary signals, the signals of signals. They represent in themselves abstractions of reality and permit of generalizations, which indeed makes up our special human mentality . . . [1941, p. 43].

With the emergence of the "second signal system," or language, Pavlov speculated that qualitatively unique "higher nervous activity" results. However, it was Ivanov-Smolenskii, chairman of the 1950 Joint Session, who developed the major technique for studying on the second signal system (Cole & Maltzman, 1969).

While Pavlov's speculations motivated much of the early research on language, a less powerful influence at that time came from outside formal psychological circles. Vygotsky, a contemporary of Pavlov's, had a broad background in literature and philosophy, and, around 1934, began intensive research on the origins of consciousness in children. Just ten years later Vygotsky died of tuberculosis, leaving behind a considerable amount of writing in various stages of completion, and a dedicated group of active psychologists such as A. R. Luria, A. N. Leontyev, and A. V. Zaporozhets.

Vygotsky (1962), who was quite skilled at applying the laws of dialectical materialism to developmental psychology,[1] considered a word to be "a microcosm of human consciousness," a product of social human history. Language is not a product of thought, according to Vygotsky; it is dynamically interrelated with thought. In contrast to Piaget and other Cartesian "idealist" psychologists, Vygotsky argued that language evolves as a function of the speech communication experiences of a child within society. During the course of human development, interpersonal speech communication internalizes and becomes a system of intrapersonal verbal communication. The result of this internalization process is that man becomes, in Pavlovian terminology, the highest self-regulating system.

Vygotsky's view of language differs from the more traditional Western psycholinguistic position in two major ways. First, the materialist view posits no internal language mechanisms which are genetically transmitted. The child talks with his culture before he can talk with himself. This view leads to the second point, that speech is viewed as more than a convenient vehicle for transmitting language

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[1] In an interesting and otherwise carefully thought out essay, Fodor (1973) naively assumes that Vygotsky wanted to ". . . pursue a straightforward 'scientific' investigation of the relation between talking and thinking: one which adopted no philosophical preconceptions whatever and no generalizations except those dictated by experimental results." For an excellent treatment of Vygotsky's dialectical approach, see Berg (1970).

in all its internal, intricate splendor.[2] Rather, it is a dynamic action system which is in a constant state of reciprocal transformation with thought.

Vygotsky believed with Pavlov that language transforms the individual into the highest self-regulating system. Because of language, behavior transcends direct dependence upon external stimuli. "Voluntary behavior" implies that verbal planning precedes overt action. In addition to this theoretical contribution, Vygotsky placed the problem squarely in the arena of developmental psychology.

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[2]It should be noted that a psycholinguist might quickly cite de Saussure's 18th century distinction between la langue (the system) and la parole (the vocal output). However, while this distinction is precisely the one made by Soviet theorists, it receives virtually no explicit treatment in the psycholinguistic literature.

III
Soviet Research on the Verbal Control of Behavior

In 1958 the Soviet Academy of Pedagogical Sciences published Volume II of Problems of the Higher Nervous Activity of Normal and Abnormal Children (in Russian) edited by A. R. Luria. The volume contains the results of an extensive research program on speech and the development of voluntary movements in normal children, and deviations from such development in the mentally retarded. Luria's chapter, which integrates the lengthy technical reports into the Vygotsky perspective, was the basis for his 1957 Special Lectures at the University of London (Luria, 1961), his 1958 paper delivered to the 15th International Congress of Psychology (Luria, 1959) and his 1960 participation in the Third Macy Conferences on the Central Nervous System and Behavior (Luria, 1960). However, the reports of Tikhomirov (1958) and Yakovleva (1958) provide the necessary detail which is understandably lacking in the Luria overview.

The apparatus for the study of the verbal control of behavior, developed by Ivanov-Smolenskii, is quite simple. The subject sits immediately in front of a display panel containing a single stimulus light which can vary in duration from a quick flash to a long interval. The color of the stimulus light can also vary. The subject continuously holds a rubber response bulb attached to an event recorder which records all squeezing action as well as the onset and duration of the stimulus light. For the sake of clarity, let us also keep the experimental procedures simple. A child is instructed to perform a simple action such as "squeeze the ball when you see the light come on."

The degree to which the young child adapts his action to the required instruction determines the level of his voluntary behavior. To quote Tikhomirov (1958): "The specific stimulus which evokes voluntary movement is the word, which doesn't simply replace the direct signal, but facilitates the abstraction and generalization of direct signals." However, very young children (up to 2 1/2 years of age) often press more than once (perseveration), press when there is no light at all, or press in strict coordination with the duration of the stimulus light. Yakovleva (1958) describes this finding in the following manner:

> We explained all these peculiarities of mastering and carrying out preparatory instructions by pre-school children in terms of the inadequate development in these children of the forms of synthetic activity which are realized on the level of the second signal system and by the fact that in our experimental set-up the connections of the second signal system had still not acquired a dominant meaning and reactions largely continued to be structured by the direct stimuli (by kinesthetic stimuli coming from the hand held balloon, and by the light stimuli coming from the flashing lamp, which evoked a strong orienting reaction). The diffuseness of nervous processes characteristic for a child of this age led to the fact that the excitation evoked by each of these direct stimuli irradiated, which led to diffuse reactions that were difficult to regulate.

Luria (personal communication) has recently termed such unstable behavior stereotypic: that is, the instruction to press only once conflicts with the child's own movements.

When spoken instructions fail to mediate naturally, the situation can be altered in order to bring about the desired effect. First, instructions can be continuously repeated in order to assume significance over the natural tendency to squeeze impulsively. The child can also receive continous verbal reinforcement concerning the correctness of his response to each stimulus. Third, nonverbal reinforcement (such as changing the flashing light so that it remains on until the hand squeeze occurs, or

a bell rings after the response) can be used, only if this additional signal is supplemented with meaningful instructions to the subject (e.g., "turn the light off by squeezing the bulb"). Without meaningful instructions the additional signal causes even more extra-signal squeezing to occur.[3]

Instead of stabilizing the child's responses by means of meaningful verbal instructions, speech can also have a more direct motor effect on the child. The instructions to vocalize a single syllable (e.g., "go" or a nonsense syllable) in response to the light produce less impulsive hand squeezes, and this self-regulatory speech is motorically based. In Tikhomirov's words:

> We view the word as a complex stimulus having a two-fold influence. The word can have a direct influence in virtue of its pronunciation, and a mediating influence in virtue of the system of selective connections, which is actualized under the influence of the word.

Another finding by Tikhomirov, which was not mentioned by Luria, helps to explain the facilitative effects of overt pronunciation. Tikhomirov's data clearly show that a child's hand squeeze is faster than his ability to vocalize "go" to a stimulus light when the two actions are measured independently. However, when the two responses are combined, and the vocalization follows the hand-squeeze, the hand-squeeze takes longer than it did when the vocalization was omitted.

Tikhomorov (1958) summarizes the ages and stages in the development of the verbal control of behavior quite succinctly:

> In the first stage, where we basically find pre pre-school children and only occasionally three-year-olds, there simply exists no regulatory influence of the connections which stand behind the word. The impulsive influence of the word stands in the front rank. Regulation of positive motor reactions by means of a speech impulse is hindered by the difficulty in creating a system of speech-motor reactions. In the second stage, with children of age 3-4 years, a clear regulation of motor reactions is formed with the aid of an auxiliary speech impulse. The word, which forms the signal meaning of the stimulus, acts not selectively but impulsively, and hence regulates the motor reactions only when the impulsive and selective influences are of the same sign. When they are of opposite sign, the impulsive influence of the word dominates, and for this reason adding the response "must not" to an inhibitory signal leads to an inhibition of a delayed motor reaction.[4]
>
> In the third stage, with five-year-olds, movement regulation is effected by the system of selective connections actualized by the word. Even when the impulsive and selective influences of the word come into conflict, the specifically selective influence of the word predominates, which organizes the realization of the motor reactions in the execution of the instruction.
>
> Subsequent development presumably consists of an ever increasing selective influence of speech, but no longer in the form of external pronunciation, but in the form of inner speech or of the traces of connections which are set up in accordance with the preparatory instruction and which become so solid that it is unnecessary to present them in external speech.

Another form of conflict is aroused when the verbal instructions conflict with the child's immediate perception, and echopraxic behavior is the result. One of Luria's students, Ye. V. Subbotskii (1972a, 1972b) has recently completed a series of experiments which analyze echopraxia. Subbotskii's experiments (1972a) involved giving children of various ages a rattle and a small furry dog. The experimenter also had the same objects, and the child was asked to hold up the dog when the experimenter

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[3] Wozniak (1973) and myself (Wilder, 1969) have both mistakenly assumed that speech signals were replaced by the additional external signal. However, Tikhomirov emphasizes the speech-based nature of this manipulation by reporting that some children immediately became timid and refused to play the game when they were not informed of the additional signal.

[4] Here the Soviet jargon is somewhat confusing. "Inhibition of a delayed motor reaction" means that the child fails to delay his response, or incorrectly presses the bulb.

held up the rattle, and vice versa (reverse association). Second, the children were tested on their ability to hold up the dog when the experimenter pointed to his watch, and to hold up the rattle when shown a pencil (simple association). Third, the children were instructed to perform the reverse association when the experimenter pointed to the dog, and vice versa. Children under three could not do the reverse association, although they easily mastered the simple association. Subbotskii reasoned that the regulatory function of speech was operative since children could perform the simple association, but that the conflict between immediate perception and the instructions hindered performance in the conflict situation. Further, since the children produced even more errors when the experimenter pointed during the reverse association, it was concluded that the child's dependence upon his perception was not imitative or "echoic." In another series of experiments, Subbotskii (1972b) asked children who performed either the simple association or the reverse association to judge the correctness of a peer's performance. It was found that the children under three could not recognize incorrect performance in peers, which suggests that the ability to adapt one's own behavior to a verbal request preceeds the ability to perceive it in others.

Thus Soviet research on the verbal control of behavior involves the careful analysis of the child's ability to subordinate his behavior to verbal instructions when such instructions conflict with the immediate environment. When the conflict is with the child's own movements, stereotypic behavior results; when the conflict is with perception, echopraxia is produced.

It should be emphasized that nonverbal conditioning procedures could be implemented to reduce perseveration or teach reverse associations in young children. However, such procedures would tell us nothing about the origins of the verbal control of behavior. It is presumed that verbal self control is truly human behavior, and to study its processes is to study the genesis of higher mental processes in a social environment.

IV
Non-Soviet Research

In the United States, the Soviet study of the verbal control of behavior is usually associated with young children saying "go" and squeezing response bulbs. The finding that such vocalizations facilitate performance appears to be quite similar, at first glance, to the Kendlers' (1961) finding that relevant overt verbalization is superior to silent performance (especially in younger children), or to the Meichenbaum and Goodman (1969) finding that overt verbalization of "faster" and "slower" produced desired effects on finger tapping. It should be emphasized that such overt verbalization effects are different in two major respects from those reported in the verbal control of behavior research. First, the vocalization must precede the response in the above studies, and it follows the bulb-squeeze response. Second, the vocalization reinforces the semantic aspect of the utterance in the learning and conditioning research, while the motor component is significant in the Soviet research. Clearly, then, the "mediation" involved in vocalizing "go" is of a more different form than response-produced stimuli. As was pointed out earlier, the vocalization increases the latency of the hand squeeze response which precedes it, which suggests some type of central nervous system mediation.

The studies which were aimed at direct replication of the motor component of verbal self regulation (Jarvis, 1968; Wilder, 1969; Miller, Shelton, & Flavell, 1970) all utilized procedures derived from American experimental learning research. In a characteristically sterile atmosphere, therefore, the effect was randomly eliminated, and comparatively little attention was paid to the processes involved. Wozniak (1972) has criticized every conceivable deviation from the appropriate procedures, and only the replication itself remains to be done.

In conclusion, the Soviet research on the verbal control of behavior cannot be explained in traditional Western psychological terminology. It is a combination of physiological and social theory. Perhaps this research answers too few questions of interest to Western researchers. But, then, it wasn't meant to.

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